

Declass Review by NGA.

13 September 1967

DEVELOPMENT OBJECTIVES

Rapid Alignment Device for Microstereoscope (Stereo Alignment Through Anamorphic Lenses)

1. INTRODUCTION

These development objectives describe the requirements to be met in the design and fabrication of an optical device which will facilitate and improve the process of aligning stereo imagery to be viewed through a microstereoscope.

2. CONCEPT

It appears that a relatively simple, inexpensive, demountable optical device can be developed which will cause the images displayed through the separate eyepieces of a microstereoscope to be presented superimposed to the viewer so that he may make the various adjustments necessary for optimized stereo viewing. The scope of this development will be the design and fabrication of an operational prototype of such a device.

3. GENERAL DESCRIPTION

It is frequently necessary to view stereoscopic pairs of photo imagery which are not inherently aligned, that is, they must be translated and rotated under the viewing device before they are properly centered, correlated and oriented (with respect to the eye base). Some microstereoscopes now have the capability for compensating additional variations in scale and anamorphic distortion between the stereo images. All of these compensations require manual adjustment and visual comparison through two separate optical trains. The initial adjustments can be correlated in the normal viewing mode but the residual discrepancies are not readily identifiable in separate eye paths; consequently, the last part of the compensating adjustment process is time-consuming and incomplete. The residual uncompensated distortion between the stereo images causes additional eyestrain and fatigue during the interpretation process. The anamorphic correction which is attained through special eyepieces, is particularly difficult to achieve without superimposition. This development is for a device to superimpose the two images and thereby permit the operator to better visualize the alignment process. This will eliminate some of these variables and thereby speed up the alignment of stereo pairs.

Anamorphic lenses consist of auxiliary cylindrical zoom or prismatic optical systems which are mounted on the eyepieces of the microstereoscope. These special anamorphic eyepieces adjust for the differential X and Y scale

found in the imagery. The Rapid Alignment Device would be mounted upon the end of the anamorphic eyepieces and provide for superimposing the left and right images. The superimposed images shall be viewed through either a monocular eyepiece or through binocular eyepieces (binocular viewing is preferred), thereby, permitting the operator to observe the relative effects of each individual optical adjustment.

4. REQUIREMENTS

4.1. Mechanical

4.1.1. The device shall be compatible with the following existing anamorphic eyepiece systems:

(a) [] anamorphic eyepiece prototype for use on the [] Zoom 70 microscope equipped with [] 10X wide field eyepieces.

(b) The [] advanced anamorphic eyepiece prototype for use on the Zoom 70 equipped with [] 10X wide field eyepieces.

(c) The [] advanced anamorphic eyepiece for use on the [] High-Power Stereoviewer (prototype currently under development) equipped with [] 6X compensating eyepieces or [] 10X compensating, wide field, high eye point eyepieces.

These anamorphic eyepieces and/or dimensional drawings of the instruments will be supplied to the contractor as Government furnished equipment for reference for a reasonable period during the contract.

4.1.2. Overall dimensions of the device shall be kept within the approximate limits of 4 1/2 inches wide, 4 inches high, and 3 inches deep.

4.1.3. Light-weight materials shall be used throughout in the construction of the device.

4.1.4. In use, the device shall be easily connected to the anamorphics by means of a quick connect mechanism. After alignment of a stereo pair has been achieved, the device shall be conveniently removed by means of a quick disconnect mechanism. Connection and removal of the device shall not alter the settings of the anamorphic adjustments.

4.1.5. To the extent possible, location in space of the eyepiece (or eyepieces), when the device is in use, shall be at a comfortable viewing height for a seated operator.

4.1.6. If the design of the device incorporates binocular viewing of the stereo images, an adjustment for variation in interpupillary distance between 55-75 mm shall be provided together with an easily readable graduated scale to indicate actual millimeter setting. The interpupillary adjustment shall be provided with a positive lock.

4.1.7. If the design of the device incorporates monocular viewing of the stereo images, a focus adjustment shall be provided in the viewing eyepiece.

If the design of the device incorporates binocular viewing of the stereo images, common focus of both viewing eyepieces, and differential focus of one viewing eyepiece shall be provided.

The purpose of these focusing adjustments is to compensate for variations between the eyes of different observers, and to compensate for variations in position of the focal planes produced by different eyepieces.

4.1.8. The device shall incorporate a means of adjusting the spacing of the two optical systems of the device at the point of attachment to the anamorphic eyepieces. This adjustment shall be capable of being locked in position. The purpose of the adjustment is to avoid changing the interpupillary distance setting of the anamorphic eyepieces when attaching the alignment device to the eyepieces.

4.2. Optical

4.2.1. The device shall not defocus the image of the system with which it is used.

4.2.2. The device shall not change the magnification range of the instrument with which it is used.

4.2.3. The device shall not reduce the field of view of the instrument with which it is used by more than 5%.

4.2.4. The device shall not reduce the resolution of the instrument with which it is used by more than 10%.

4.2.5. The device shall not reduce the light level transmitted by the instrument with which it is used by more than 40%.

4.2.6. The device shall not change the orientation of the image as seen in the instrument with which it is utilized.

4.3. Miscellaneous

4.3.1. One (1) complete set of engineering drawings, consisting of an assembly and details, shall be submitted with the prototype. These drawings shall accurately describe the device in its final configuration.

4.3.2. Any special tools, fixtures, or instruments necessary for alignment and/or subsequent operation of the device shall be considered as being part of the prototype and shall be included in the cost proposal.

4.3.3. A complete set of operating instructions shall be furnished.